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WORK ASSIGNMENT REPORT
Tranche 1, Objective 1

Information System Framework for the Environmental Disasters Management Unit

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Table of Contents

1. Information system requirement:

The system objective:

The system aims to:

- Provide all necessary information in order to manage crisis/disasters.
- Gives appropriate support to decision making during the crisis/disaster different phases.
- Allow for incidents and situations presentation in front of the crisis/disaster management team.

System main requirements:

- Dealing with all environmental disasters types such as :

  1. Natural disasters like biological, genetic and global disasters, which could have either a direct or an indirect impact on the environment; consequently, leads to an environmental disaster.

  2. Man made disasters whether it is intentialy made or not, but leads to an environmental disaster.

  3. Combined disasters (man and nature) those may start by man and then nature plays main role to escalating. On the opposite, disaster may start naturally then the mal behaviors of man make it worse. All such disasters become environmental disasters when they lead to free chemical, biological substances, or radiation into the different environmental components and affect them in such a way that local resources can not overcome.

- Getting information concerning sources of potential hazards that might lead to environmental disaster:

  1. **Industry:** facilities producing or using big quantities of hazardous wastes.

  2. **Transportation:** facilities like air cargo, highways, railways, and waterway transportation**.**
  3. **Warehouses:** large stores store chemicals, fuels, and other hazardous materials, **especially** in airports, and suburbs of cities and ports.

  4. **Facilities handling radiating materials :** nuclear reactors, hospitals, and research centers

  5. **Waste dump : dumps around cities and sludge areas**

  6. **Facilities for waste water treatment and industrial**

  7. **Facilities that deals with genetic and biological materials**

  8. **Damage disposal from industrial firms**

- Giving support in decision making during all phases of disaster management, these phase are :

1. Preparation phase, which includes activities that take place prior to the disaster which try to limit the causes or minimize its hazardous; also activities leading to skills and capabilities upgrading in order to confront the disaster and minimize its destructive impacts.
2. Confrontation phase, which includes activities, related to disaster management during its occurrence, which requires co-operation with all parties to secure minimum possible losses.

3. Recovery phase, which includes activities related to preparing short and long term plans to regain normal life in the disastered area .

- Providing all information about relevant entities with environmental disaster.
  Examples of this information are:

1. Experts and consultants
2. Available resources
3. Roles & responsibilities of entities at different level.

- Providing all necessary information relating to environmental conditions and Specifications:

1. Air pollution
2. Water pollution
3. Soil pollution

2. Types and nature of required data:

Required data in EDMU information system divides into:

Basic data (doesn't depend on disaster type) It includes:

- General data:

- Egypt geographic specifications
- Demographic distribution
- Transportation networks
- Administrative boundaries
- Infrastructure for public utilities
- Main and important establishments and sites.

- Experts and consultants data

- Personal data
- Field of specialization
- Means of communication

- Experiences and qualifications
- Pre- experience with EEAA

- Available capabilities and resources data

- Environmental disasters relevant entities
- Available human resources
- Equipment & facilities
- Level of preparation for disaster confrontation

- Environmental specifications and conditions data

- Air pollution
  Emissions concentrations that creates a crisis / disaster regarding:
  Sulphur dioxide, ozone, suspended particulates, fine particulate (less than 2.5 micrometer, carbonmonoxide)
- Water pollution
- Soil pollution

Environmental disasters data, which includes:

- Environmental disasters types

- Disaster type and characteristics.
- Hazards level
- Level of negative impacts on the environment
- Expected scenarios of disaster occurrence
- Pollution control policies
- Regulation and policies for disaster avoidance
- Types and nature of resources and capabilities needed to deal with
- Previous similar crisis / disaster data

- Sources of potential hazards

- Types and nature of environmental disasters.
- Available Disasters confrontation plans
- Types of potential disasters and their hazards level.
- Self facilities for confrontation
- Means of co-operation with other parties
- Nature of the surrounding environment
- Type and extend of impact on the surrounding environment
- Applied precautions and safety procedures

- Standard Operations procedures during disaster management

- Preparation phase operation procedures
- Confrontation phase operation procedures
- Recovery phase operation procedures

3. Data sources:

Main data sources needed for establishing and implementing information system for EDMU include:

- General data sources are :

- Ministries , agencies and relevant entities
- Governmental and local units
- Central Agency for public Mobilization and Statistics
- Survey Authority
- Cabinet Information and Decision Support Center

- Experts and consultants data sources are :

- Ministry of Interior – Civil Defense Unit
- Ministries , agencies and relevant entities
- Universities , scientific and research institutions
- Egypt Environmental Affairs Agency (EEAA)
- Foreign Expertise consultants.

- Available resources and capabilities data sources are :

- Ministry of interior
- Government and local units
- Ministry of Defense
- Egypt Environmental Affairs Agency (EEAA)

- Conditions and environmental specs data:

- Egypt Environmental Affairs Agency (EEAA)
- International environmental organizations
- Environment protecting organization in different countries

- Environmental disaster data sources are :

- Egypt Environment Affairs Agency (EEAA)
- Ministry of Interior –Civil Defense Unit
- Ministries , agencies and relevant entities
- Facilities , companies and agencies that deal with environmental pollution sources
- International environmental institutions
- Environment protection agencies in different countries

4. Data Bases:

Main databases in EMDU shall include:

- Geographic data base:

Includes all data related to the geographic, demographic, transportation networks, administrative boundaries, main and important establishment in Egypt…etc

- Agencies data base:
  Includes all data related to entities that deals with the disaster during its management phases such as basic data, roles responsibilities, commercial procedure…etc.

- Personnel data base:
  Includes all data related to people who deal with the disaster. Examples of these data are personal data, field of specialization, means of communication, experience, and previous experience with the EEAA.

- Environmental specs data base:
  Includes all date related to conditions and environmental standard specification in Egypt and other countries.

- Resources and capabilities database:
  Includes all available resources and capabilities whether inside or outside the EEAA as for type of these resource, place, specification, capacity, status.

- Hazardous Substances database:
  Includes all data related to hazardous substances types, procedure of handling locations and level of its danger…. Etc.

- Entities Environmental disaster sources database:
  It includes all types and kinds of entities that might be a source for a disaster. The database includes data about existing entities, their confrontation plans, local facilities, potential effect on surrounding area...etc.

- Environmental disasters database:
  It includes all data about disasters, their type, nature, characteristics, scenario, and required facilities for confrontation…. etc.

- Rules and regulations database:
  It includes all laws, rules and regulations related to the disaster management field.

5.Computer Application for decision making support:

The major applications for EDMU information system are:

- Incidents recording and monitoring :
  This application aims at entering, storing and updating the incidents data, retrieval of all needed information, and producing status reports.

- Incident state Evaluation :
  This application depends on evaluating a certain instant, estimating the possibilities of environmental effects and comparing it with the standard environmental specifications and conditions in order to assess the situation and determine the appropriate procedures.

- Experts and consultants registry and selection :
  This application aims at recording and updating experts and consulting database and selecting appropriate personnel according to the type of disaster and the nature of the personnel experience.

- Environmental crisis / disaster prediction :
  This application aims at processing and evaluating the incoming data about different disasters and crises, and predicts its occurrence and rate of evolution

- Environmental crisis scenarios :
  This application aims at analyzing and preparing scenarios for disaster type, providing the possibilities for retrieval of these scenarios and determining the
  Possibilities of its occurrence and the type of possible environmental effects.

- Standard Operation Procedures for disasters :
  This application aims at evaluating and preparing all kinds of standard operation procedures for different disasters and providing facilities for retrieval of these procedure and the entities responsible for implementation.

- Environmental impact assessment :
  The application aim at providing facilities to assess environmental pollution degree based on the received notification and reports .It also helps on defining the possible expected environment effects.

- Disaster recovery procedure :
  This application aims at preparing recovery procedures for different disaster type and providing retrieval facilities for such data and entities responsible for implementation

- World - wide Environmental disaster follow up :
  These application aims at keeping trade of environmental disasters in the world, knowing their place and the reason of their occurrence, also the procedure followed to manage in order to benefit from these data in similar disasters.

- Data Recording and updating :
  This application provides facilities for recording and updating data and information in database in a simple and friendly procedure.

- Data Retrieval disaster :
  This application provides facilities for retrieval data and information from database in a simple and friendly procedure.

- Reports and statistics preparation :
  This application aim at providing periodical and statistical reports available at data bases according to EDMU requirements.

- Environmental effects maps :
  This application aims at drawing the environmental effect maps for possible disasters and retrieving the disaster state occurrence on maps.

In addition to these applications, disasters might have its own application type that might help in dealing with during different management phase.

6. Integration and co-operation with currently exciting information systems in EEAA:

Integration and co-operation with currently exciting information systems in EEAA is considered a major requirement in, as this leads to:

- Making use of the available data and information
- Avoid duplication in work

Those systems includes:

*** EEIS:**
Egyptian Environmental Information System:
It provides environmental geographical data for EEAA decision-makers.

***IPIS:**
Industrial Pollution Information System:
It provides data/ information pertaining to industrial discharge monitoring and compliance

***EIAIS:**
Environmental Impact Assessment Information System:
It provides data/ information pertaining to evaluating environmental impact assessments for different field.

* **ICPIS:**
International Conventions and Protocols Information System:
It provides data/information pertaining to Egypt's performance in meeting standards as established under various conventions and protocols.

***HSIMS:**
Hazardous Substances Information & Management System:
It provides data needed to trace the hazardous substances and to minimize the risk of handling.

***WWTFIS**:
Environmental Contingency Planning Information System for Water/ Waste water Facilities:
It is provides data/ information for contingency planning in water and wastewater disasters management.

The following illustrates the framework for WWTFIS due to its importance for EMDU information system

Water and Wastewater facilities failure information system (WWTFIS)

Water and wastewater facilities failure in Egypt is one of man-made disasters, which may happen in the future. These facilities include industrial facilities which discharge wastewater producing from industrial process into sewer network and then to wastewater treatment plants or directly into water sources. Discharge in water sources is done after local treatment for the

disposal water and it is under limitations and monitoring, but if type of failure happen during treatment process in local treatment plant or wastewater treatment plants it will cause environmental issue. Also some types of failure probably happen in water treatment plants and it will also negatively affect the environment.

WWTFIS Scope:

The Water and Wastewater Treatment Facilities Information System is a collection of data, information and communication measures which helps in analyzing and arriving at solution quickly. So the next time there is a similar disaster, the agency would not only be better equipped but also be able to minimize the damages to the environment.

The objective of the system would be the following:

- Prepare for and respond to the risks of water and waste water disasters and promote early warning systems and facilities for the rapid dissemination of information and warnings.

- Determines and assign roles and responsibilities for dealing with the disaster at the strategic, tactical and operational level.

- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of emergency.

- To provide a GIS to support the agency in making executive decisions in the event of disaster.

- Quick analysis and assessment of the damage and the amount and kind of relief required to set procedural guidelines and sets of measures to deal with different types of water and wastewater treatment failures.

- Gives automatic acquisition of fertilizers, chemicals and toxic inventory and water / wastewater treatment operations data to permit rapid review by program.

- Graphical display methods permit rapid identification of any wastewater discharge and emergency action zone.

- Simple initial operation procedures required of the use, which utilize default scenarios, and limit requirements for new information prior to display tentative results.

- User flexibility permits the input of a wide variety of modifications to the model data.

- User flexibility permits the geographical analysis and database query.

- Incorporation of the highlights of the Emergency plan procedures, particularly notification protocols.

- System locatable so as to be accessible to emergency personnel with provision for remote access or duplicate accesses to the systems information should the prime location be untenable.

WWTFIS Structure:

The Work Plan for the development of the WWTFIS is broken into eight components and a number of associated tasks. These include the following:

1- System analysis
2- System design
3- Database design
4- Application Design
5- System build and test
6- Meta data database integration
7- System introduction
8- Maintenance introduction

WWTFIS Data Domain:

- Hydrographic, which maintains the information, related to seas, rivers, canal, etc.
- Water and Waste Water sources
- Regulations and Laws.
- Land use that maintains all the information related to land occupation, type of occupation (residential and agriculture), main establishments (organizations, tourist, pump stations, power stations), cultural and heritage sites.
- Infrastructure for potable water, sewage and electricity data.
- Industries and treatment plants that maintains information on treatment operations.
- Soil that maintains information related to the type of soils.
- Chemicals and fertilizers information.
- Transportation networks.
- Emergency information
- Environmental quality for the important environmental information.
- Topography likes spot levels.
- Biodiversity for protectorates information.

Database Business Areas:

- Danger sources, hazardous materials, and its measurements:-
  (WWTP, WTP, facilities, industrial sectors, power stations, transformation stations, control rooms, pump stations, energy, chemicals, fertilizers, parameters, conditions, and regulations)

- Water suppliers and wastewater collectors:-
  Water resources (Nile, lakes, seas, canals, drains, and sanitary network)

- Solid waste collectors and sludge description:-
  (Disposal sites and sludge management systems)

- Land use / land cover:-
  (Road networks, culture sites, land use, soil classifications, soil suitability, geology,

and wadies)

- Environment:-
  (Environmental sites, habitat, agricultural areas, and crops)

- Crisis and contingency plans documentation:-
  (Environmental management systems, crisis types and contingency plans)

7. Applied example of Cairo air pollution crisis/disaster:

Types and nature of required data:

- Air pollution and emission data :
  - Emission types and concentration
  - Emission maps
  - Emission maps and air quality
  - Means and locations of pollution measurement
  - Previous and current emission standards all over Cairo.
  - Critical air concentrations

- Pollution sources data:
  - Industrial locations
  - Industrial facilities
  - Open work places
  - Electrical power stations
  - Motorcycles and vehicles
  - Quarries
  - Large workshops and garages

- Pollution limitations policies:

  - Solid waste management
  - Agriculture waste management
  - Gases emission reduction
  - Motorcycles emission reduction
  - Brick factories emission reduction
  - Air pollution emissions
  - Gas combustion efficiency improvement

- Relevant Entities:

  - Egyptian Environmental Affair Agency (EEAA)
  - Cabinet Of Ministers
  - Ministry of Mass Communication.
  - Ministry of health
  - Federation of Egyptian Industry.
  - Central Agency for public Mobilization and statistics.
  - Scientific Research centers

- Lists of people in charge and specialists.

- Previous crisis/disasters data:

- Cairo air smoke phenomena Oct. 1998
- Cairo air smoke phenomena Oct. 1999

  - Environmental monitoring concentration during the phenomena
  - Wind speed and directions
  - Particulate concentration
  - SO2 (Sulphur dioxide concentration)
  - O3 (Ozone concentration)

Proposed Databases:

- Environmental specifications
- Geographical database
- Entities database

Proposed applications

- Air concentration assessment
- Standard operation and recovery procedures
- Environmental effects map